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RUBBER-TAPPING EXPERIMENTS: TWO CUTS VERSUS ONE CUT.

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DEPARTMENT OF AGRICULTURE, CEYLON.

BULLETIN No. 41.

RUBBER-TAPPING EXPERIMENTS: TWO CUTS VERSUS ONE CUT.

By T. PETCH.

THOUGH it is generally held that the yield from two superposed cuts is about 40 per cent. more than that from a single cut on the same fraction of the circumference, there do not appear to be any published experimental results which demonstrate that, and, *a fortiori*, none which show how much each of the two superimposed cuts contributes to their total yield. It is known, from Lock's experiments (Circulars, R. B. G., Vol. VI., No. 8), that when a tree is tapped in the old way with six cuts on half the circumference, the yield of latex from the lowest cut, in the later stages of tapping, is greater than that from all the other five together. But there is no data, extending over any considerable length of time, referring to two cuts only.

To obtain some definite information on the point raised, an experiment was begun at Henaratgoda on September 1, 1916. The trees, as far as can be ascertained, were then about twenty years old. They are planted about 18 feet by 18 feet in three rows, with more or less open ground on either side. To avoid, as far as possible, any differences due to the individuality of the trees, the two cuts and the comparative single cut were placed on opposite quarters on the same tree, *i.e.*, each tree was tapped on opposite quarters, with two cuts on one quarter and one cut on the opposite quarter. The trees had been opened for tapping in 1914 with three cuts on one-third, but the tapping had been stopped when about 3 inches of bark had been removed. The position of the two quarters was necessarily governed by this previous tapping. To keep them a quarter of the circumference apart, they overlapped the old tapping symmetrically on either side to the extent of 1/24th of the circumference. Further, as the previous tapping had been placed somewhat at random, though generally more or less on the north side, the orientation of the quarters was not constant, but varied from east and west, almost to north and south.

Forty trees were taken and divided into two groups of twenty each. In the first group a single oblique cut to the left (A) was made on one quarter at a height of 15 inches from the ground, and on the opposite quarter a similar cut (B) at

15 inches, and another (C) 12 inches above B. In the second group the tapping pattern was the same, but C was 24 inches above B. The trees were tapped three times per week, and the rubber from each set of cuts was collected and weighed separately. The average girth of the trees at 3 feet was 55 inches in Group I., and 47 inches in Group II. The experiment was begun on September 1, 1916, and tapping was completed at the end of June, 1918, the number of tappings being 257 in Group I. and 258 in Group II. One foot of bark was tapped out on each cut.

The total yields for the twenty-two months were as follows :—

Group I.—B and C, One Foot apart.

Cut A, 71,448 gms. ; cut B, 69,921 gms. ; cut C, 30,686 gms. Or in lb. per tree : cut A, 7·87 lb. ; cut B, 7·7 lb. ; cut C, 3·38 lb. In lb. per tree per annum, this is : cut A, 4·3 lb. ; cut B, 4·2 lb. ; cut C, 1·8 lb. Taking the yield of cut A as 100, the yields of the three cuts are in the ratios of 100 : 98 : 43. Thus, the yields of the two bottom cuts, A and B, over a period of nearly two years are practically identical, while the yield of cut C, 1 foot above B, is 44 per cent. of B.

The monthly yields, &c., of Group I. are given in the following table. The second half of the table gives the ratios of the yields of the three cuts for each month, that of cut A, the single cut, being taken as 100. It will be seen that these ratios are not uniformly consistent, though the differences in this case are usually within the limits of error. For the first three months cut B yielded slightly more than cut A. For the first year the sides were not tapped in any particular order, though C was always tapped before B. From October 1 to December 31, 1917, the cuts were tapped in the order A, C, B, and from January to June, 1918, in the order C, B, A. This does not appear to have made any difference in the relative yields. The tapper tapped each tree on all three cuts before proceeding to the next. A table showing the variation in the average yield per tapping per month of each cut is given later.

Table I.—Twenty Trees, tapped on opposite Quarters, Three Times per Week.

One Cut on One Quarter ; Two Cuts, 1 Foot apart, on the other. (Yields per Month, in Grams.)

1916.	Number of Tappings.	Cut A.	Cut B.	Cut C.	Cut A.	Cut B.	Cut C.
Sept.	13	3,244	3,368	1,587	100	104	49
Oct.	11	3,078	3,326	1,414	100	108	46
Nov.	13	3,818	3,931	1,670	100	103	44
Dec.	12	2,684	2,463	1,217	100	92	45

1917.	Number of Tappings.	Cut A.	Cut B.	Cut C.	Cut A.	Cut B.	Cut C.
Jan.	12	2,399	2,268	1,183	100	95	49
Feb.	12	2,279	2,336	1,105	100	103	48
Mar.	14	3,132	3,014	1,379	100	96	44
April	10	2,279	2,311	979	100	101	42
May	12	3,074	3,154	1,451	100	103	47
June	12	3,016	2,816	1,360	100	93	45
July	11	2,883	2,725	1,276	100	95	44
Aug.	13	3,753	3,557	1,644	100	95	44
Sept.	9	2,758	2,645	1,422	100	96	52
Oct.	12	4,230	4,104	1,864	100	97	44
Nov.	11	4,005	3,819	1,648	100	95	41
Dec.	12	4,388	4,349	1,754	100	99	40
1918.							
Jan.	14	4,619	4,642	1,802	100	100	39
Feb.	11	4,027	3,863	1,583	100	96	39
Mar.	12	2,931	2,764	1,228	100	94	42
April	11	3,664	3,441	1,264	100	94	34
May	9	2,748	2,731	893	100	99	32
June	11	2,439	2,295	963	100	94	40

Group II.—B and C, Two Feet apart.

Cut A, 45,791 gms.; cut B, 50,611 gms.; cut C, 25,139 gms. Or in lb. per tree: cut A, 5 lb.; cut B, 5·57 lb.; cut C, 2·77 lb. In lb. per tree per annum, this is: cut A, 2·7 lb.; cut B, 3 lb.; cut C, 1·5 lb. Taking the yield of cut A as 100, the yields of the three cuts are in the ratio of 100 : 110 : 55. Thus, the yield of cut B, the bottom cut on the two-cut side, is 10 per cent. greater than that of A, the cut at the same level on the single cut side; while the yield of cut C, 2 feet above B, is half that of B.

The monthly yields of Group II. are given in the following table. The second half of the table gives the ratios of the yields of the three cuts for each month, that of cut A, the single cut, being taken as 100. Cuts B and C give a result similar to that of the corresponding cuts in Group I., the yield of the upper cut C being in this case one-half that of B. But the ratios of the yields of A and B show somewhat extraordinary results. For the first three months the yield of B is 26 per cent. greater than that of A. Consequently the yields of B and C together are almost double that of A for those three months. Had the experiment not been continued, and had there not been another group available for comparison it might have been deduced that with the cuts 2 feet apart two cuts yielded twice as much as one cut. The remainder of the experiment shows that this high ratio of the yield of B to A was not maintained. The yield of B is greater than that of A, except for three months out of the twenty-two, but the difference in some months is small. It rose again suddenly to 18 per cent. in December, 1917, and to 25 per cent. in January,

1918, but the total difference is only 10 per cent. The cuts of Group II. were tapped in the same order as those of Group I.

The behaviour of cut B recalls the story which was once current concerning Hevea tapping on the Amazon, viz., that before the tapper made the cuts from which he intended to collect latex, he made another higher up the tree, and that caused a greater flow from the lower cut. But the results in the present case do not support an explanation of that kind. We should have to assume that the upper cut had no influence when the cuts were 1 foot apart, but a beneficial influence when they were 2 feet apart.

The decisive fact appears to be that in both groups the yield of the upper cut is about half that of the lower. If the upper cut exerted a beneficial influence on the lower, we should expect its yield to bear a much smaller ratio to that of the lower in Group II., where this supposed influence is exhibited, than in Group I., where it is not. The explanation is probably that in Group II. there are trees which yield more on one side than on the other. In general, in the published experiments on this point, the yield on opposite sides of a tree is the same, but exceptions have been recorded.

Table II.—Twenty Trees, tapped on opposite Quarters, Three Times a Week.

One Cut on One Quarter; Two Cuts, 2 Feet apart, on the other. (Yields per Month, in Grams.)

1916.	Number of Tappings.	Cut A.	Cut B.	Cut C.	Cut A.	Cut B.	Cut C.
Sept.	12	1,443	1,785	1,023	100	124	78
Oct.	13	2,268	2,883	1,472	100	127	65
Nov.	11	1,940	2,461	1,213	100	127	63
Dec.	13	1,860	2,131	1,198	100	115	64
1917.							
Jan.	13	1,355	1,481	949	100	109	70
Feb.	12	1,010	966	726	100	96	72
Mar.	13	1,568	1,619	1,058	100	103	67
April	11	1,751	1,933	972	100	110	56
May	13	2,080	2,241	1,328	100	108	64
June	11	1,793	1,705	1,116	100	95	62
July	13	2,383	2,533	1,239	100	106	52
Aug.	13	2,412	2,459	1,259	100	102	52
Sept.	10	2,248	2,354	1,076	100	105	48
Oct.	10	2,625	2,695	1,167	100	103	44
Nov.	11	2,720	2,912	1,104	100	107	41
Dec.	12	2,973	3,513	1,383	100	118	47
1918.							
Jan.	12	2,682	3,342	1,409	100	125	53
Feb.	12	2,523	2,809	1,309	100	110	51
Mar.	11	1,381	1,605	867	100	116	63
April	12	2,310	2,661	1,240	100	115	54
May	9	2,030	2,202	994	100	108	40
June	11	2,436	2,321	1,037	100	95	43

Variations in Yields.

The third table gives the ratio of the average yield per tapping each month to the yield per tapping in the first month for each cut separately, the yields per tapping in the first month being taken as 100. It, therefore, shows the monthly variation in the yield per tapping for each cut if read vertically. But it does not give the relative yields of the different cuts. For example, in Group II., December, 1916, A and B show ratios of 119 and 108 respectively, but reference to the second table shows that B was then yielding more than A. All that the third table shows is that A had increased 19 per cent. on its original yield, while B had only increased 8 per cent.

The higher ratios shown in the case of Group II. are partly due to the fact that the initial yields of the cuts on those trees were small. The yields of all the cuts follow the same general course. They fell in December, 1916, and did not rise again to the November level until July–August, 1917. They fell again in March, 1918, but recovered in April, with the exception of cut C, Group I. The latter cut was then approaching the tapped basal area below it. The figures do not show any marked influence of one cut on another, nor any falling off in the yield as the section was tapped out. With regard to the latter point, the figures for June, 1918, should be disregarded, as several trees in Group I. were stopped before the end of the month, owing to the fact that it had been necessary to tap thicker on them than on the rest of the group in order to obtain latex.

The average girth of the trees in Group I. was 55 inches, and Group II. 47 inches. The yield per inch of circumference, taking the single cut A only, was 35·4 grams in Group I. and 26·6 grams in Group II. per annum. The trees of Group I. were consequently much better yielders than those of Group II. They are of the same age, planted at the same distance, and part of the same rows. If anything, the neighbourhood of Group II. is more open than that of Group I. They were tapped by the same tapper, and there is no evident explanation of the difference in yield. In both groups the yield is small; possibly deeper tapping was required.

The monthly rainfall and the number of rainy days per month are given in Table III. In Ceylon the highest yields are obtained in the period September–December, though January and February may also be good yielding months. The trees winter in the months January–March, and it would appear that the yield is related to the annual cycle of the tree's activities, being least at the beginning and greatest towards the end of its yearly period. This, however, may be modified by weather conditions.

The ratios given in Table III. are those of the average yield per tapping per month. They show that the yield fell in December, 1916, contrary to expectation, probably owing to the small rainfall of that month. It fell further in January and February, 1917, during the wintering period, and though it increased during the abnormally heavy rainfall of March, 1917, it did not rise to the previous October level. In 1918 the yields during January and February were large, and about the same as those of the previous December. The fall in 1918 comes in March. While the figures do show some variation dependent on the rainfall, they also indicate that the principal cause of variation is the annual cycle of the tree.

Table III.

1916.	Group I. A.	Group I. B.	Group I. C.	Group II. A.	Group II. B.	Group II. C.	Rainfall in Inches.	Number of Wet Days.
Sept.	100..	100..	100..	100..	100..	100..	6·21	15
Oct.	112..	117..	105..	145..	148..	133..	8·97	16
Nov.	118..	117..	105..	146..	149..	129..	9·65	14
Dec.	90..	79..	83..	119..	108..	108..	0·67	4
1917.								
Jan.	80..	73..	81..	87..	76..	86..	4·52	8
Feb.	76..	75..	76..	70..	57..	71..	5·88	6
Mar.	90..	83..	81..	101..	83..	95..	12·37	15
April	91..	89..	80..	132..	117..	104..	6·29	10
May	102..	102..	99..	133..	115..	120..	9·92	8
June	100..	91..	93..	136..	103..	119..	4·48	17
July	105..	96..	95..	152..	130..	112..	2·73	13
Aug.	116..	106..	103..	155..	126..	114..	3·41	14
Sept.	122..	114..	130..	187..	157..	129..	18·95	16
Oct.	141..	132..	126..	219..	180..	138..	6·36	10
Nov.	146..	134..	123..	206..	177..	118..	13·24	17
Dec.	146..	140..	120..	207..	195..	135..	3·46	6
1918.								
Jan.	132..	132..	106..	186..	186..	138..	2·94	7
Feb.	146..	136..	118..	175..	156..	128..	1·85	2
Mar.	98..	89..	84..	105..	97..	93..	4·23	3
April	133..	121..	94..	164..	148..	121..	9·05	13
May	122..	117..	81..	188..	163..	129..	17·79	18
June	89..	81..	72..	184..	141..	111..	9·69	19

T. PETCH.

October, 1918.